Biological Forum
an International Journal 17(8): 55-59(2025)
ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Influence of Weather Parameters on the Population Dynamics of Chilli Mite, *Polyphagotarsonemus latus* (Banks)

Heera Kumari[1]*, R.K. Meena[2], Akhter Hussain[2], Neelam Kumari[1], Sanjay Kumar Bagaria[4], S.L. Sharma[3] and Suman Choudhary[3]
[1]Ph.D. Scholar, Department of Entomology,
Sri Karan Narendra Agriculture University, College of Agriculture, Jobner (Rajasthan), India.
[2]Professor, Department of Entomology,
Sri Karan Narendra Agriculture University, Jobner (Rajasthan), India.
[3]Assistant Professor, Department of Entomology,
Sri Karan Narendra Agriculture University, Jobner (Rajasthan), India.
[4]Ph.D. Scholar, Department of Agricultural Entomology,
Maharana Pratap University of Agriculture & Technology, Udaipur (Rajasthan), India.

(Corresponding author: Heera Kumari)*
(Received: 07 May 2025; Revised: 18 June 2025; Accepted: 15 July 2025; Published online: 04 August 2025)
(Published by Research Trend)

ABSTRACT: Chilli is a valuable vegetable crop, and its spiciness is due to an alkaloid called capsaicin, which also has notable medicinal benefits. The chilli crop is severely affected by the yellow mite (*Polyphagotarsonemus latus*), which can lead to significant yield losses. To better understand its behavior, a study on the population dynamics of this pest was conducted during 2023 and 2024 at SKNAU, Jobner. The infestation of yellow mites commenced in the last week of August (35th SMW) in 2023 and 2024 and remained throughout the crop season during both the years. Initially, the mean population was 0.88 and 1.48 mites per three leaves during 2023 and 2024, respectively, which gradually increased and touched its peak with mean population of 21.32 mites per three leaves in second week of October (41th week) during 2023 while, 22.40 mites per three leaves in same duration in 2024. After reaching the peak, the population of mite started to decline during both the years. Occurrence of chilli mite is positively correlated with maximum temperature (r = 0.697 and r = 0.822) during 2023 and 2024, respectively.

Keywords: Chilli, yellow mite, *Polyphagotarsonemus latus*, population dynamics, positively, weather parameters.

INTRODUCTION

Chilli (*Capsicum annuum* L.) is regarded as one of the most commercially significant spice crops and is often referred to as a "wonder spice" due to its widespread culinary use across the globe. In India, it is an essential condiment found in almost every household and is a good source of vitamins A, C, and E (Mondal and Mondal 2012). Chilli is consumed in various forms such as vegetables, sauces, pickles, and curries. It holds an important place both as a vegetable and a spice crop in India. A 100-gram edible portion of capsicum contains approximately 24 kcal of energy, 1.3 grams of protein, 4.3 grams of carbohydrates, and 0.3 grams of fat (Anonymous, 2001). Medicinally, chilli is known to help in treating ailments such as fevers, colds, indigestion, and constipation, and it also acts as a natural pain reliever (Dagnoko *et al.*, 2013). India is the world's largest producer, consumer and exporter of chilli contributing almost one fourth of the world production (Maurya *et al*. 2016). India is the world leader in chilli production followed by China, Thailand, Ethiopia and Indonesia. In the country, green chilli cultivated in the area of 418 thousand hectares with an annual production of 4505 thousand metric tonnes during 2021- 22 (Anonymous, 2022). Chilli is the major spice crop in India, which has the highest area under cultivation and a production share of 22.71 % of all spice crops. In India, it is a high value crop and is intensively cultivated in Andhra Pradesh, Telangana, Tamil Nadu, Karnataka, Madhya Pradesh, Maharashtra, Himachal Pradesh and in hilly areas of Uttar Pradesh (Nagesh and Aishwaryaram 2022). The leading state in chilli production during 2020-21 is Andhra Pradesh with a total production of 4.07 lakh tonnes from 2.25 lakh ha, followed by Karnataka, West Bengal and Madhya Pradesh.

In Rajasthan, chilli is cultivated over an area of approximately 7.75 thousand hectares, with an annual production reaching 26.43 thousand metric tonnes (Anonymous, 2022). The key chilli-producing districts in the state include Jodhpur, Pali, Bhilwara, Jaipur, Ajmer, Tonk, Udaipur, and Bharatpur. The crop is known to be affected by around 57 insect species and 2 non-insect pests (Reddy and Puttaswamy 1985), among which the tarsonemid mite *Polyphagotarsonemus latus* (Banks) and the thrips species *Scirtothrips dorsalis* Hood are particularly harmful and regarded as major threats. Yield losses due to broad mite infestations can be as high as 96.39 % (Borah, 1987). Mite infestation has emerged as a serious challenge in chilli cultivation. The problem typically begins in nurseries around July and gradually spreads to the main field, causing substantial damage. Infestation symptoms include downward curling of leaves and fruit drop, especially under severe conditions (Pena and Bullock 1994). Due to variation in the agro-climatic conditions of different regions insects show varying trends in their incidence, nature and extent of damage to the crop. The incidence and spread of the chilli sucking pests is affected by various abiotic factors *viz.*, temperature, relative humidity, rainfall, *etc.* (Yadav *et al*., 2022). With shifting weather patterns and changing pest dynamics, it is crucial to understand the population trends of these key pests. Such knowledge will support the development of effective pest monitoring and management strategies. Effective pest management relies on understanding the various factors that influence pest population dynamics on specific crops, as this knowledge can help predict their occurrence in a given region (Subha Rani and Singh 2007). Therefore, analyzing how meteorological parameters affect pest incidence in chilli crops is essential for developing timely and accurate forecasting systems for crop protection.

MATERIALS AND METHODS

The field study was carried out at Sri Karan Narendra Agriculture University, Jobner, Rajasthan, India during *Kharif* 2023 and 2024. Forty day old seedlings were transplanted in the main field. To study the population dynamics of chilli mite in relation to weather parameters, chilli variety RCH-1 were transplanted in both the years of experimentation in five plots of 2.4 × 2.25 m^2 size keeping row to row and plant to plant distance of 60 and 45 cm, respectively. Recommended agronomic package of practices were adopted for raising the crop excluding the plant protection measures. The population of chilli mite was recorded by counting both nymphs and adults from three leaves representing top, middle and bottom portion from five randomly selected and tagged plants in each plot at weekly interval from the appearance to last picking of the chilli fruits. Leaves were kept in separate labelled polythene bags for observing in binocular. The leaves were placed on the sticky transparent tape (4 × 10 cm) and were allowed to dry at room temperature. The mites which crawled from the leaves on drying were counted on the tape in laboratory under sterio-binocular microscope having 15X magnification and the population per three leaves per plant was computed. The sticky transparent tape method given earlier by Harvey and Martin (1988) for counting mite was employed with slight modification in the tape size as per the requirement of the study. The population of mites was recorded as mites per three leaves per plant. The data on mite population recorded in the experimental plot for population dynamics correlated with different weather parameters *viz.* temperature (Maximum, Minimum), relative humidity and rainfall which were obtained from Department of Agricultural Meteorology, Sri Karan Narendra Agriculture University, Jobner, Jaipur.

RESULTS AND DISCUSSION

Results on population dynamics by direct counting revealed that yellow mite (*Polyphagotarsonemus latus*) is also the major pest found to be infesting chillies. The incidence of mite on chilli crop in the present study commenced in last week of August (35th SMW) and remained active throughout the crop season *i.e.* third and fourth week of December during 2023 and 2024 respectively. The peak population of 21.32 and 22.40 mites per three leaves per plant was recorded in the second week of October during *Kharif*, 2023 and 2024, respectively, when the prevailing maximum temperature of 35.50°C and 36.90°C, minimum temperature of 16.40°C and 20.70°C, relative humidity of 47.00 and 51.00 per cent and rainfall of 0.00 mm and 0.00 mm, respectively, thereafter the population decreased gradually (Table 1 and 2). The results of present investigations are similar with the findings reported by Bokan *et al*. (2015) who revealed that the incidence of mites started from 36th SMW and maximum mites population were recorded during 42nd meteorological week. Baral (2017) observed that mite population persist throughout the crop season from fourth week of August (34th SMW) and was continued up to fourth week of December (51st SMW). The population increased gradually and touched its peak in the third week of October (42nd SMW). Patil and Nandihalli (2009) reported that *P. latus* occurred on chilli throughout the summer and population peaks were observed in April and May. During the *Kharif* season, population initiated during October with peak population during November. Ashraf *et al.* (2011) observed that yellow mite population was almost higher in autum (September-October) and spring months (March) and they obtained peak (3.92-8.8 mites/leaf) activity of the mite during last week of October a mild peak (0.05-1.57 mites/leaf) in March in different chilli cultivar, whereas reduced activity during November-April except chilli cultivar. Pathipati *et al*. (2014) recorded two peaks of chilli mite one during 38th SMW and the other during 52th SMW (16.0 and 21.27/ leaf respectively).

The mite population exhibited significant positive correlation (r = 0.697and r = 0.551) with maximum and minimum temperature respectively, whereas, the non-significant positive correlation (r = 0.136) with rainfall and negative (r = -0.364) with relative humidity during 2023 (Table 1 & Fig. 1). The mite population exhibited significant positive correlation (r = 0.822) with maximum temperature, whereas, the negative significant correlation (r = -0.485) with relative humidity. Minimum temperature showed non-significant positive correlation (r = 0.412) while, rainfall showed negative non-significant correlation (r = -0.412) with mite population during 2024 (Table 2 & Fig. 2). The work of studies on correlation of mite population with the weather parameters are supported by the findings of Ashraf *et al.* (2011) who found a significant positive association between adult yellow mite population and maximum temperature in chilli varieties. Samanta *et al.* (2017) observed a significant positive correlation between population of yellow mite and mean temperature. Tonet *et al*. (2000) earlier also observed a direct proportional relationship between yellow mite population and temperature. Chakrabarti and Sarkar (2014); Pal and Karmakar (2017); Rajput *et al*. (2017) also found a significant positive association between yellow mite and temperature in chilli. Borah (1987) also observed that the mite population was favoured by higher temperature coupled with lower humidity having lesser intensity of rainfall.

Table 1: Population dynamics of chilli mite in relation to weather parameters in *Kharif*, 2023.

Sr. No.	SMW*	Date of observation	Temperature (°C)		Average Relative Humidity (%)	Rainfall (mm)	Mites/three leaves
			Max.	Min.			
1.	33	13-08-23	34.40	22.50	59.00	0.00	0.00
2.	34	20-08-23	33.80	22.80	62.00	0.00	0.00
3.	35	27-08-23	35.50	21.30	50.00	0.00	0.88
4.	36	03-09-23	37.00	21.50	56.00	0.80	3.24
5.	37	10-09-23	36.00	22.70	63.00	7.00	11.08
6.	38	17-09-23	32.40	21.80	72.00	49.80	13.32
7.	39	24-09-23	35.60	19.80	54.00	2.40	14.04
8.	40	01-10-23	36.30	15.50	44.00	0.00	16.32
9.	41	08-10-23	35.50	16.40	47.00	0.00	21.32
10.	42	15-10-23	33.00	15.10	51.00	0.00	19.08
11.	43	22-10-23	33.00	13.00	47.00	0.00	15.84
12.	44	29-10-23	33.70	13.30	47.00	0.00	14.56
13.	45	05-11-23	33.00	13.10	49.00	0.00	10.96
14.	46	12-11-23	27.60	9.30	47.00	0.00	9.00
15.	47	19-11-23	28.10	8.10	44.00	0.00	8.84
16.	48	26-11-23	24.50	10.70	64.00	1.00	5.40
17.	49	03-12-23	25.30	8.30	60.00	0.00	4.32
18.	50	10-12-23	26.60	5.50	56.00	0.00	2.04
19.	51	17-12-23	25.00	5.50	51.00	0.00	1.24
20.	52	24-12-23	25.00	4.90	60.00	0.00	0.00
Correlation coefficient (r) of mite			**0.697****	**0.551***	-0.364	0.136	

*Standard meteorological week, *= Significant at 5% level, **= Significant at 1% level

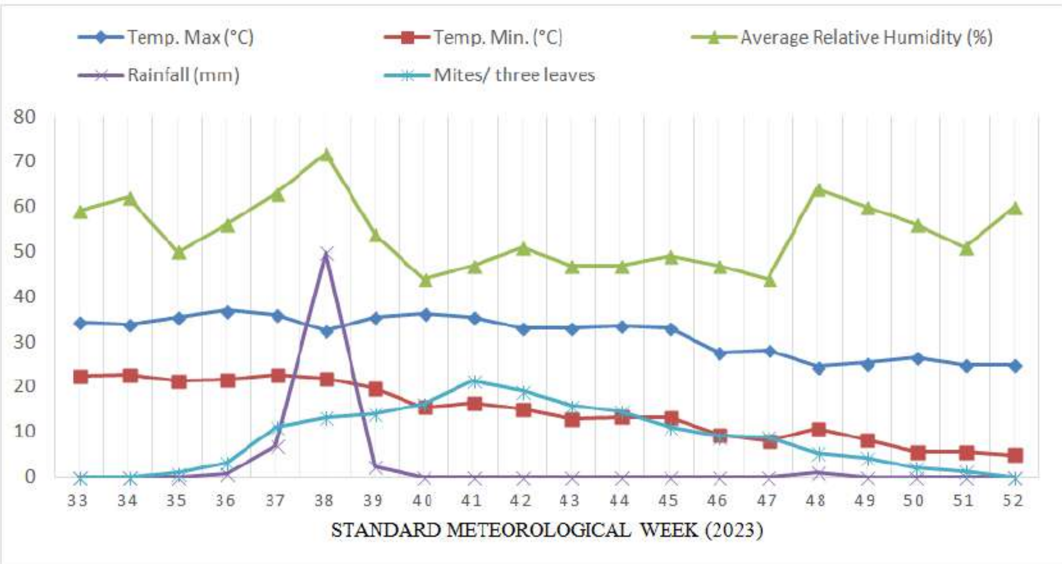

Fig. 1. Population dynamics of chilli mite in relation to weather parameters in *Kharif*, 2023.

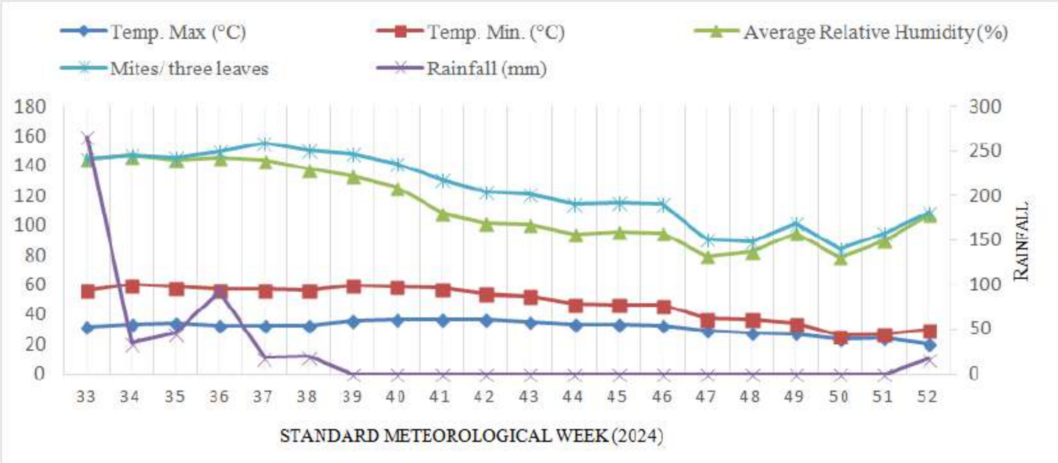

Fig. 2. Population dynamics of chilli mite in relation to weather parameters in *Kharif*, 2024.

Table 2: Population dynamics of chilli mite in relation to weather parameters in *Kharif*, 2024.

Sr. No.	SMW*	Date of observation	Temperature (°C)		Average Relative Humidity (%)	Rainfall (mm)	Mites/ three leaves
			Max.	Min.			
1.	33	15-08-24	31.41	24.84	89.00	266.40	0.00
2.	34	22-08-24	33.11	27.20	87.00	34.80	0.00
3.	35	29-08-24	33.91	24.54	86.00	45.20	1.48
4.	36	05-09-24	32.54	24.24	89.00	93.70	3.88
5.	37	12-09-24	32.81	24.18	87.00	18.30	11.44
6.	38	19-09-24	32.67	23.54	82.00	19.30	12.72
7.	39	26-09-24	35.42	24.37	74.00	0.00	14.64
8.	40	03-10-24	36.40	22.52	67.00	0.00	15.68
9.	41	10-10-24	36.94	20.71	51.00	0.00	22.40
10.	42	17-10-24	36.58	17.21	48.00	0.00	21.40
11.	43	24-10-24	35.04	17.45	48.00	0.00	20.84
12.	44	31-10-24	33.24	13.90	47.00	0.00	20.68
13.	45	07-11-24	33.35	13.47	49.00	0.00	19.64
14.	46	14-11-24	32.54	13.51	49.00	0.00	19.44
15.	47	21-11-24	29.08	8.17	42.00	0.00	11.40
16.	48	28-11-24	27.88	8.71	46.00	0.00	6.52
17.	49	05-12-24	27.10	6.70	61.00	0.00	6.88
18.	50	12-12-24	23.72	1.78	53.00	0.00	5.64
19.	51	19-12-24	24.05	3.04	63.00	0.00	5.04
20.	52	26-12-24	20.27	9.52	78.00	16.50	1.44
Correlation coefficient (r) of mite			**0.822****	0.412	**-0.485***	-0.412	

*Standard meteorological week, *= Significant at 5% level, **= Significant at 1% level

CONCLUSIONS

Yellow mite were found to be major insect pests of chilli and their presence was moderate to high during the experimental period. The peak population of chilli mite was recorded in the second week of October during *Kharif*, 2023 and 2024. Simple correlation studies revealed that there was significant effect of maximum temperature on incidence of chilli mite. Hence the population is in dynamics during the entire period and the appropriate IPM practices can be followed during the peak incidence of pest.

Acknowledgement. The senior author thanks the Dean, SKN College of Agriculture, Jobner (Sri Karan Narendra Agriculture University, Jobner) Jaipur, Rajasthan for providing facilities.
Conflict of Interest. None.

FUTURE SCOPE

The present study highlights the significant influence of weather parameters on the population dynamics of chilli mite, offering valuable insights for pest management. In the future, this research can be extended by developing predictive models using long-term weather and pest data, exploring the impact of microclimatic factors, and integrating crop phenology. Expanding the study to different agro-climatic regions, assessing the potential effects of climate change, and incorporating findings into digital advisory tools for farmers can enhance practical applications. Additionally, integrating this knowledge with sustainable pest management strategies will support more effective, eco-friendly control measures.

REFERENCES

Anonymous (2001). Nutritive value of Indian foods *www.doctorndtv.com/ health/nutritive.value.asp*. 79.

Anonymous (2022). Rajasthan Agricultural Statistics at a Glance. Horticulture Department, Jaipur.

Baral (2017). Population dynamics and bio-efficacy of new insecticides against insect pests of chilli, M.Sc. thesis submitted to VNMKV, Parbhani.

Bokan, S. C., Jadhav, K. M., Zanwar, P. R. and Bhosle, B. B. (2015). Studies on population dynamics of major pests of chilli and its correlation with weather parameter. *Journal of Entomological Research*, *39*(1), 61-64.

Borah, D. C. (1987). Bio-ecology of *Polyphagotarsonemus latus* (Banks) (Acari: Tarsonemidae) and *Scirtothrips dorsalis* Hood (Thysanoptera: Thripidae) infesting chilli and their natural enemies. Ph. D. Thesis, University of Agriculture Sciences Dharwad, Karnataka (India), 165.

Chakrabarti, S. and Sarkar, P. K. (2014). Studies on efficacy of some acaricidal molecules for the management of *Polyphagotarsonemus latus* (Banks) (Acari, Tarsonemidae) infesting chili (*Capsicum annuum* L.) in West Bengal. *Current Biotica*, *7*, 299–305.

Dagnoko, S., Yaro-Diarisso, N., Sanogo, P. N., Adetula, O., Dolo-Nantoume, A., Gamby-Toure, K., Traore-Thera, A., Katile, S. and Diallo-Ba, D. (2013). Overview of pepper (*Capsicum* spp.) breeding in West Africa. *African Journal of Agricultural Research*, *8*(13), 1108-1114.

Harvey, T. L. and Martin, T. T. (1988). Sticky tape method to measure cultivar effect on wheat curl mite (Acari: Eriophyidae) population in wheat species.

Maurya, A. K., Kushwaha, M. L., Jain, V. K. and Singh, N. (2016). Evaluation of chilli (*Capsicum annuum* L.) genotypes for yield and performance against diseases. *Progressive Research – An International Journal, 11* (Special VII), 4615-4617.

Mondal, B. and Mondal, P. (2012). Eco friendly pest management practices for leaf curl complex of chilli (*Capsicum annuum* L.). *Journal of Biopesticides, 5*(6), 115.

Nagesh, and Aishwaryarani, B. B. (2022). Evaluation of chilli (*Capsicum annuum* L.) genotypes for Murda complex and fruit borer. *The Pharma Innovation Journal*, *11*(6), 546-548.

Pal, S. and Karmakar, K. (2017). Population dynamics and management of yellow mite, *Polyphagotarsonemus latus* (Banks) (Acari: Tarsonemidae) infesting gerbera under protected cultivation. *Journal of Entomology and Zoology Studies*, *5*(5), 795-799.

Pathipati, V. L., Vijayalakshmi, T. and Naram, N. L. (2014). Seasonal incidence of major insect pests of chilli in relation to weather parameters in Andhra Pradesh. *Pest Management in Horticulture Ecosystem, 20*(1), 36-40.

Patil, R. S. and Nandihalli, B. S. (2009). Seasonal incidence of mite pests on brinjal and chilli. Karnataka *Journal of Agriculture Science, 22*(3), 729-731.

Pena, J. E. and Bullock, R. C. (1994). Effects of feeding of broad mite (Acari: Tarsonemidae) on vegetative plant growth. *The Florida Entomologist, 77*(1), 180-184.

Rajput, V. S., Prajapati, B. G., Pareek, A. and Patel, P. S. (2017). Studies on population dynamics of major pests infesting chilli (*Capsicum annum* L.). *International Journal of pure and applied Bioscience*, *5*(6), 1465-1470.

Reddy, D. N. R. and Puttaswamy (1985). Pests infesting chilli (*Capsicum annum* L.) in the nursery. *Mysore Journal of Agricultural Sciences, 18*(2), 122–125.

Samanta, A., Koushik, S. and Indranil, B. (2017). Incidence study of yellow mite and thrips and their natural enemies in relation to weather parameters on chilli. *Journal of Entomology and Zoology Studies, 5*(4), 1213-1216.

Subha, R. S. and Singh, T. K. (2007). Influence of meteorological factors on population dynamics of pod fly, *Melanagromyza obtusa* Malloch (Diptera: Agromyzidae) in pigeon pea under agro-climatic conditions of Manipur. *Indian Journal of Entomology*, *69*(1), 78-80.

Tonet, R. M., Leamel, S., Neigh, J. D. and De Nejri, J. D. (2000). Population fluctuation of broad mite on silicon lemon crop. *Brazil, Lorenja, 21*, 39 48.

Yadav, S., Kumar, L., Jakhar, A., Kumar, H., Jat, M.K., Kapoor, P. and Kumar, V. (2022). Population dynamics of major sucking insect pests on chilli (*Capsicum annum* L.). *Journal of Agriculture and Ecology*, *13*, pp.79-91.

How to cite this article: Heera Kumari, R.K. Meena, Akhter Hussain, Neelam Kumari, Sanjay Kumar Bagaria, S.L. Sharma and Suman Choudhary (2025). Influence of Weather Parameters on the Population Dynamics of Chilli Mite, *Polyphagotarsonemus latus* (Banks). *Biological Forum, 17*(8): 55-59.